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R. Y. Stuart, Secretary

GEOLOGIC AND TOPOGRAPHIC SURVEY
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# COAL BEDS IN NORTHERN SOMERSET COUNTY, PENNSYLVANIA

By

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## Introduction.

Somerset County ranked sixth in Pennsylvania as a bituminous coal-producing county in 1921; approximately 9,000,000 net tons, havin an approximate value of $26,100,000, were produced by commercial mines and country banks. Northern Somerset County produced 8,000,000 net tons. Of the total quantity produced, 8,623,857 tons were loaded at the mines for shipment; 195,061 tons were sold to local trade and used by employees; 156,891 tons were used at the mines for steam and heat; the remainder was used principally by farmers for domestic fuel. The average value of the coal at the mine was $2.90 per ton. In 1921 the total number of employees was 13,132, and the average number of days worked was 173.

Somerset County lies west of Allegheny Mountain, and on the southern boundary of Pennsylvania. It is bounded on the west by Fayette and Westmoreland counties; on the north by Cambria County; and on the east by Bedford County. The area discussed in this report lies north of the line of 40° north latitude, which extends east and west across the county through Edgemont, a southern suburb of the town of Somerset. The townships included in this district are:

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* The bulletin numbers are continuous although the functions of the Survey have been transferred from the Department of Internal Affairs to the Department of Forests and Waters.

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Conemaugh, Jenner, Paint, Ogle, Shade, Quemahoning, Lincoln, and that part of Somerset and Stony Creek townships lying north of the line of 40° north latitude.

There are eight coal beds of mineable thickness in this district. The Lower and Upper Kittanning are by far the most important. The Brookville is mined on Stony Creek south of Johnstown, and the Upper and Lower Freeport are mined at various points throughout the district. The Lower Kittanning bed is most important in Paint township, where it is mined extensively in the vicinity of Windber. The Upper Kittanning is a large producer, particularly in Jenner, Lincoln, Somerset, and Quemahoning townships.

Many other beds are too thin to be mined under present conditions, but are large reserves for future use.

The coal from this district is valued highly for generating steam. It is generally soft and friable, but stands transportation well. It is not "sized," but shipped run-of-mine. A large proportion of shipments go east to tidewater, and north to the Lakes. The Pennsylvania and Baltimore and Ohio railroads use large quantities of Somerset County coal.

The transportation of coal from this district depends almost entirely upon a branch line of the Baltimore and Ohio railroad running between Rockwood, Somerset, Boswell, Benson, and Johnstown. Numerous small spurs from this branch line serve the outlying coal producing centers. The Western Maryland railroad uses the Baltimore and Ohio tracks from Rockwood to Coal Junction. Their own spur runs from that point to Gray and Bell. A branch line of the Pennsylvania railroad extends south from Johnstown along Stony Creek to Windber and nearby mining towns.

The population of this district is grouped into numerous small mining towns situated along the railroads. These mining towns are connected by good roads, most of which are dirt. An improved road extends from Somerset through Sipesville to Johnstown. These roads afford an excellent means of transporting coal to railroad sidings when the price of coal is high and small mines can afford to operate by trucking the coal.

Allegheny Mountain on the east and Laurel Hill on the west are the chief topographic features of the district. Allegheny Mountain is a high, narrow ridge, having a gradual slope in Somerset County which is not deeply dissected by streams. Laurel Hill is also a high, narrow ridge, with a steep eastern slope much dissected by streams. The valley between the two ridges is approximately 20 miles wide. Numerous small ridges in the valley make the topography rugged in some parts, and rolling in others. The streams flow in rather dee valleys, particularly Stony Creek and its eastern tributary, Shade Creek.

# STRUCTURE.

Seven structural features, each having a northeast-southwest trend, have been mapped by George B. Richardson of the United States Geological Survey. The data presented here are a result of the writer's preliminary studies on the structure, and it is understood that the descriptions are tentative and subject to revision when Mr. Richardson's reports on the Somerset and Windber quadrangles are published. The structural features are, in order from east to west, Savage Mountain anticline, Berlin syncline, Negro Mountain anticline, Somerset syncline, Boswell anticline, Johnstown syncline, and Laurel Hill anticline.

Savage Mountain anticline crosses the extreme southeastern corner of this district, and is an eastern extension of the eastern flank of the Berlin syncline. The axis of this anticline forms the crest of Allegheny Mountain.

Berlin syncline in this part of Somerset County is approximately 1 mile south of Shanksville and extends in a general northeast direction near Buckstown and Cairnbrook. This syncline forms a broad basin, having its deepest point at the southern edge of the district. The dips on both flanks are small, the greatest being on the eastern flank and in the immediate vicinity of Boone. North of the Lincoln Highway and Buckstown the syncline flattens out gradually, and extends northeastward in the vicinity of Arrow as a monocline.

Negro Mountain anticline lies northwest of Berlin syncline. It is less pronounced and much smaller here than in the southern part of the county. It enters northern Somerset County 5 miles east of Somerset on the Bedford road, extends northeast, and passes near Lambertsville and Forward. Approximately 1½ miles northeast of Forward, and 2 miles northwest of Cairnbrook, the anticline flattens out and merges with the extension of the Berlin syncline. The dips on both flanks of Negro Mountain anticline are gradual. The crest is wide and the axis locally varies much in direction. The highest structural elevation is 1½ miles south of Forward in the immediate vicinity of Ridge School.

Somerset syncline lies northwest of Negro Mountain anticline, enters this district 3 or 4 miles southwest of the town of Somerset, and extends in a northeast direction west of Stony Creek. This structure is very irregular, forming a broad basin in the vicinity of Lavansville where it has merged with the Johnstown syncline. Northeast of Somerset the basin is narrower and the dips on the flanks increase. North of Stoystown the dips decrease until the structure loses its identity north of Hooversville, and continues as a part of a broad monocline.

Boswell anticline is a pronounced local structure in the vicinity of Sipesville, Ralphton, Jenner, Boswell, and Jerome. The highest structural point on this anticline is approximately 1 mile west of Ralphton and Stoughton. The axis of this structure is very

regular, extending from a point about 1 mile east of Harrison to the immediate vicinity of Boswell. The dips on both flanks are regular, the greatest being on the northwest.

Johnstown syncline, lying northwest of Boswell anticline, is the deepest structural basin in the district. About 1 mile south of Lavansville it is merged with the Somerset syncline, but splits from it in the vicinity of Zimmerman and extends in a northeast direction near Edie, Jennertown, Glessner, and Forwardstown. The deepest point in this basin is in the immediate vicinity of Glessner. The only remaining area of Pittsburgh coal in this part of Somerset County is in the hilltops in this deep part of the basin. The southern end of the syncline is broad and the dips very low. The dips increase northeastward and the syncline narrows. Northwest of Glessner the rocks rise about 700 feet to the mile.

Laurel Hill anticline is the most pronounced structural feature in the district. Its axis follows the top of Laurel Hill, which is the boundary line between Westmoreland and Somerset counties. The Pottsville, Mauch Chunk, and Pocono formations are brought to outcrop. The axis is highest on the county line southeast of Wilpen. From that point it dips gradually north and south. The dips on both flanks are rather steep, particularly north of the Lincoln Highway which runs between Jennertown and Laughlintown.

## STRATIGRAPHY.

The rocks outcropping in this district belong to the Quaternary, Carboniferous, and Devonian systems. The Quaternary system is represented by sand, clay, and gravel which streams have deposited along their valleys in times of high water. These deposits are most extensive in the valley of Stony Creek. The Carboniferous system is represented by the Monongahela, Conemaugh, Allegheny, Pottsville, Mauch Chunk, and Pocono formations. The Devonian system is represented by the Catskill and Chemung formations.

The Monongahela formation occurs only as a few feet of cover over the Pittsburgh coal remaining in a few high hilltops in the Johnstown basin in the vicinity of Glessner.

The Conemaugh formation outcrops in the Berlin, Somerset, and Johnstown synclines. Although it is coal-bearing, none of the beds are worked commercially at the present time, but are large reserves for future use. This formation is composed chiefly of red and olive-green shales, with numerous small beds of limestone. Several beds of heavy sandstone are also present locally.

The Allegheny formation, outcropping on the eastern flank of the Berlin syncline, on the Negro Mountain and Boswell anticlines, on the monocline in the northeastern part of the district, and on the western flank of the Johnstown basin, is the most important coal-bearing formation in the district, containing the thick and valuable Freeport and Kittanning groups of coal beds. This formation is

composed chiefly of olive-green shale, massive sandstone, and limestone beds beneath the coals.

The Pottsville formation outcrops in the eastern part of the district along Allegheny Mountain, on Stony Creek north of Foustwell and south of Mostollar, along the entire valley of Shade Creek, along Quemahoning Creek east of Boswell, and on the eastern slope of Laurel Hill. Although this is a coal-bearing formation, none of the beds are being mined at present. The Pottsville formation is composed of two or more massive sandstones which are locally conglomeritic. Between these sandstones is shale which locally contains coal beds.

The Mauch Chunk formation is composed entirely of red and olive-green shales, and thin layers of interbedded red sandstone. An important deposit of limestone locally known as the "Loyalhanna," is presumed to be a continuation of the Greenbrier limestone of West Virginia. This limestone is an important source of lime for farms in this district. The Mauch Chunk formation is not coal-bearing.

The Pocono, Catskill, and Chemung formations, outcropping on Allegheny Mountain and Laurel Hill, are composed principally of shales and a few massive sandstones which form the crest of these ridges. These formations are not coal-bearing.

Coals. The following table shows the stratigraphic relation of the coal beds, their average thickness, and the average intervals between them.

## COAL BEDS IN NORTHERN SOMERSET COUNTY.

| Formation | Bed | Average Interval | Average Thickness |
|---|---|---|---|
| Monongahela | Pittsburgh | | |
| | | 315 | |
| Conemaugh 871' | Barton | | 3' 0"(dirty) |
| | | 165 | |
| | Harlem | | 1' 6" |
| | | 150 | |
| | Lower Bakerstown | | 2' 0" |
| | | 235 | |
| Allegheny 280' | Upper Freeport ("E") | | 4' 6" |
| | | 50 | |
| | Lower Freeport ("D") | | 2' 6" |
| | | 45 | |
| | Upper Kittanning ("C'") | | 4' 0" |
| | | 70 | |
| | Middle Kittanning ("C") | | 2' 0"(dirt |
| | | 30 | |
| | Lower Kittanning ("B") | | 5' 0" |
| | | 35 | |
| | Clarion ("A'") | | 4' 0" |
| | | 15 | |
| | Brookville ("A") | | 3' 0"(dirty) |
| | | 10 | |
| Pottsville 250' | | No mineable coals | |

# SUMMARY OF COALS BY FORMATIONS.

## Pottsville Formation.

The Pottsville formation in northern Somerset County contains one or two thin unimportant coal beds in the shale interval between the two benches of the Conoquenessing sandstone. These coal beds have never been prospected because their outcrops indicate that the coal is extremely high in sulphur due to the presence of large amounts of "sulphur balls" and bony streaks.

## Allegheny Formation.

The Allegheny formation contains the greatest number of mineable coals in this district, and all of the production comes from these beds.

Brookville ("A") Coal. This bed, lying at the base of the Allegheny formation and 40 to 65 feet below the Lower Kittanning, is very persistent. The entire bed averages approximately 5 feet thick, but at most localities is too dirty to be mined commercially at the present time. It is divided into numerous benches by shale partings. The coal in these benches is also separated by many thin lenses of bone and pyrite, making the coal extremely high in ash and sulphur.

Clarion ("A′") Coal. This bed, lying a few feet above the Brookville, averages about 2½ feet thick, and is locally 4 feet thick. It has not been mined commercially because of proximity to thicker and better coals. The Clarion coal is invariably high in sulphur and ash, and is difficult to mine because of numerous shale and bone partings.

Lower Kittanning ("B") Coal. This bed is a very important producer in the district, yielding almost 4,000,000 tons annually. It is thickest and best in Conemaugh, Paint, Shade, and Quemahoning townships, where it is mined extensively. It ranges from 2 feet 8 inches to 5 feet thick in this district, averaging possibly 3½ feet. It is an excellent steam coal, and is much valued for steam, domestic, railroad, and bunker fuel.

Middle Kittanning ("C") Coal. This bed, lying 40 to 50 feet above the Lower Kittanning, is extremely impure, averages less than 2 feet thick, and has not been prospected in this district. Where thinnest its quality is excellent.

Upper Kittanning ("C′") Coal. This bed, midway between the Lower Kittanning and Upper Freeport, is the most persistent bed and the largest producer of commercial coal within the district. Its chief development is in the townships west of Stony Creek, principally Jenner and Conemaugh. It ranges from 2 feet 10 inches to 7½ feet thick. This coal is also much valued for steam, domestic, and railroad fuel.

Lower Freeport ("D") Coal. This coal, lying 50 to 60 feet below the Upper Freeport, is thickest in Somerset and Quemahoning townships, chiefly in the vicinity of Friedens. This bed ranges from 2 to 4 feet thick, averaging about 3 feet. Rolls in the floor are numerous and the quality is variable. In some localities it is an excellent smithing coal; in others, a steam coal.

Upper Freeport ("E") Coal. This bed, marking the top of the Allegheny formation, is thickest in Jenner, Conemaugh, Lincoln, Somerset, and Quemahoning townships. It ranges from 2 feet 8 inches to 6 feet thick, produces between 800,000 and 900,000 tons of coal annually, and is used for steam and domestic purposes.

## Conemaugh Coals.

The Conemaugh formation, ranging from 850 to 950 feet thick in this district, contains fifteen or more coal beds, three of which are locally workable. These beds will become important when the thicker beds of better quality have been exhausted.

Bakerstown Coal. This coal, lying 245 to 275 feet above the Upper Freeport, outcrops in the basins of this district. It ranges from 1 to 2½ feet thick. Locally this coal has very good quality, and will probably be mined in the future.

Harlem Coal. This coal, approximately 425 feet above the Upper Freeport, is thin, but has excellent quality. It ranges from 10 to 30 inches thick.

Lonaconing Coal. This coal, lying about 160 feet below the Pittsburgh, is locally 4 feet thick, but has not been mined. Its outcrop is confined to the lowest points in the Johnstown basin.

## Monongahela Formation.

The Monongahela formation has been eroded from the entire district except a small area in the hilltops north of Glessner. The Pittsburgh coal, at the base of this formation, has been mined on a small scale in these hilltops until it is practically exhausted.

The Redstone coal is in mere patches too small to mine, and the Sewickley coal horizon is represented only by black dirt which caps the hills.

## DESCRIPTION OF COAL BEDS BY TOWNSHIPS.

### Paint Township.

Brookville ("A") Coal. This coal outcrops on Shade Creek and its eastern tributaries, and along the western slope of Allegheny Mountain in the vicinity of Hagevo, Arrow, and Ashtola, and in the

valley of Babcock Run. This bed is usually thick, but extremely impure. It has been mined at several localities for local use, but at present only one mine is working it for commercial shipment. The Brookville averages about 5 feet thick, ranging from 3 to 7 feet. The roof is black shale, and the bottom, fire clay. The bed is divided into three or four benches by two or three bone partings ranging from 2 to 6 inches thick. The top bench, usually about 6 inches thick, is inferior coal but is shipped. The middle bench is separated from the top bench by 2 inches of hard black shale. The middle bench is usually about 19 inches thick, and contains sulphur streaks and nodules. The lower bench, ranging from 2½ to 5½ feet thick, is separated from the middle bench by a hard black shale parting from 4 to 6 inches thick. The bottom bench also contains many streaks of "sulphur"nodules.

Clarion ("A′") Coal. This bed has not been mined or prospected in this township. It is doubtful if it is anywhere of commercial quality or thickness. Outcrops indicate that it is usually divided into several benches by shale partings which destroy its commercial value.

Lower Kittanning ("B") Coal. This bed is the most important coal in the township. It furnishes the bulk of the production from the well-known Windber district. It is highly prized as a steam, domestic, railroad, and bunker fuel. Thousands of tons are shipped yearly to tidewater and to the Lakes. The coal outcrops well down the hills in the vicinity of Windber, and is mined by drifts. The coal can be mined also by drift along Shade Creek and its eastern tributaries, and along the eastern slope of Allegheny Mountain.

The Lower Kittanning is very regular in physical character. The bed is usually divided into two or more benches by thick shale partings. The top bench, which is mined, ranges from 3 feet 3 inches to 5 feet thick. This main and top bench is separated from a middle bench by a band of black and yellow "sulphur", and shale, locally known as "blackjack." Underneath the blackjack is a bench of coal which is not persistent, ranging from 2 inches to 2 feet 6 inches thick. This coal is rarely taken up in mining. Locally a second thin bench of coal is present beneath the blackjack.

The Lower Kittanning ranges from 3 feet 3 inches to 4 feet 6 inches thick in the vicinity of Windber. The top and main bench is usually about 3 feet 6 inches thick. It is clean coal, with the exception of some "sulphur" and shale nodules in it. This bench is separated from a bottom bench by 6 to 12 inches of bottom shale. The lower bench of coal, ranging from 0 to 2½ feet thick, is usually present, but locally the shale parting thickens and the lower bench is cut out. The roof is sandstone and shale; the bottom, hard fire clay.

In the vicinity of Rummel the Lower Kittanning averages about 4 feet 4 inches thick, ranging from 3 to 5 feet. The main and top bench is usually about 3 feet 6 inches thick, and is separated from a middle bench 2 inches thick, by a 2-inch bony coal parting.

The middle bench is separated from a lower 10 inch bench by a shale parting 8 to 10 inches thick. The roof is shale; the bottom, hard fire clay.

In the vicinity of Hagevo and Arrow the Lower Kittanning is about 4 feet thick. The top and main bench is usually about 3 feet thick, but ranges from 2 feet 6 inches to 4 feet. Locally this bench contains thick layers of black, soft "sulphur," but usually it is clean coal. The top and bottom benches are separated by a shale parting usually about 12 inches thick. Locally this parting contains "sulphur" nodules called blackjack. The bottom bench is usually from 3 to 8 inches thick. This is mined only when the quality is good. The roof is sandstone and shale; the bottom is fire clay. Locally a bony coal about 1 inch thick occurs at the top of the bed.

In the vicinity of Blough and Hillsboro the Lower Kittanning is usually about 3 feet thick, ranging from 2 feet 8 inche to 3 feet 6 inches. Two inches of bony coal at the top of the bed is hard to separate from the coal. Beneath this bony coal is a bench of good coal, usually about 20 inches thick. This rests on a parting of bone coal and "sulphur" usually about 12 inches thick. Underneath this blackjack parting is 14 inches of shale and an 8-inch bench of coal. This lower bench is mined when the quality is good. The bottom is shale and fire clay; the roof, shale and sandstone.

In the vicinity of Landstreet and Seanor east of Stony Creek, the coal averages about 3 feet 4 inches thick, and has the same physical and chemical character as at Blough and Hillsboro. It is divided into two benches by a parting of shale, bone coal, and pyrite, ranging from 4 to 16 inches thick. The bottom bench ranges from 4 to 10 inches thick.

Middle Kittanning ("C") Coal. This bed has not been mined, and is very meagerly prospected in this township. It is persistent, but too thin to be worked at present. In some localities the bony outcrop indicates that it would be too impure to be worked.

Upper Kittanning ("C′") Coal. This bed, lying from 90 to 110 feet above the Lower Kittanning, has an extensive outcrop in this township, and can be mined by drift at most places. Although not as large a producer as the Lower Kittanning in this township, this bed has an excellent reputation as a steam and domestic fuel. Large mine are now operating in it.

In the vicinity of Windber the Upper Kittanning coal averages about 5 feet thick, ranging from 3 feet 6 inches to 6 feet. It is never entirely clean, being divided into two or more benches by shale partings. The coal varies much in physical character. Locally 12 inches at the top of the bed is bony coal, and is separated from the bench below by a shale parting ranging from ½ inch to 2 inches thick. The bench of coal beneath this parting ranges from 2 to 3 feet thick, and is separated from a lower bench by a black bony shale parting, ranging from 1 to 2 inches thick. The bottom bench of coal ranges from a few inches to 22 inches thick. The roof is sandstone and shale; the bottom, limestone.

East of Windber on Paint Creek, and south of Windber on Seese Run, the Upper Kittanning ranges from 3½ to 5 feet thick, averaging 4½ feet. In these localities the Upper Kittanning is separated into two benches by a bone parting ½ inch to 2 inches thick. The top bench is usually about 2 feet thick, and the bottom bench ranges from 22 to 28 inches thick. A bony coal, ranging from 3 to 6 inches thick, is present at the top of the bed. The roof is shale and sandstone, and the bottom, shale and fire clay.

The Upper Kittanning has the same physical and chemical character at Arrow, Hagevo, Hillsboro, and Landstreet. It varies much in thickness at different localities, but is invariably separated into two or more benches by thin shale and bone partings. It is of mineable thickness practically everywhere.

In the vicinity of Hollsopple the Upper Kittanning is locally 4 feet thick, averaging 3 feet 4 inches. In many localities in this area it is free from partings. North of Hollsopple at Foustwell and Seanor and east of Stony Creek, the Upper Kittanning averages about 3½ feet thick, and is divided into two benches by a bone parting from ¼ to 1 inch thick, from 3 to 6 inches below the top. The coal above this parting is usually good, but is locally bony and must be separated from the good coal. The bottom bench ranges from 2 feet 4 inches to 3 feet 8 inches thick, and is good clean coal: In some mines this bench has 12 to 18 inches of shale beneath it, and separating it from a bottom bench of coal ranging from 1 inch to 10 inches thick. This bottom bench is not mined. In some places in this part of the township the Upper Kittanning is rather high in sulphur due to the presence of nodules and streaks of pyrite in the coal. These are readily picked out when the coal is mined.

Lower Freeport ("D") Coal. This coal has been eroded from large areas in this township. It is present in the hilltops in the vicinity of Windber, and north of Hillsboro and Seanor. It also outcrops along Paint Creek east and southeast of Windber. This bed is not being mined for commercial shipments because of the presence of thicker beds of better quality. In some localities it is 4 feet thick, but it averages less than 2½ feet. It is usually a clean bed, but is locally split into two or more benches by bone and pyrite partings.

Upper Freeport ("E") Coal. This coal, lying 45 to 60 feet above the Lower Freeport, outcrops in practically the same areas as the Lower Freeport. It also is of minor importance, and has never been a commercial producer, chiefly because it is inclined to be "faulty," and the acreage is small. Locally the bed is 3½ to 4 feet thick, but generally averages less than 2½ feet. It may be of some future importance, particularly for local fuel, when the thicker beds of better quality have been exhausted.

## Oglo Township.

Ogle township lies on the western slope of Allegheny Mountain, and is practically uninhabited. The coal-bearing formations have been eroded in much of the township, and the Pottsville formation is at the surface. The Allegheny formation outcrops in the northern part of the township near the headwaters of Paint Creek, and south of Arrow, on the headwaters of Sandy Run. Nowhere in the township is the entire Allegheny formation present. The Lower Kittanning is the only bed mined commercially. The Brookville and Upper Kittanning coals will probably be mined when railroad facilities are improved. Very little prospecting has been done in these beds, but outcrops indicate that they have the same physical and chemical character as that described in Paint township.

Lower Kittanning ("B") Coal. In the northern part of Ogle township the Lower Kittanning coal averages about 4 feet thick, and in most places is clean. Locally it is divided into two benches by a thin shale and bone parting near the top. The roof is hard shale, and the bottom, fire clay. Underneath the main bench is a local bench of coal usually about 6 inches thick, and separated from the main bench by an 8-inch shale parting.

In the southern part of the township the Lower Kittanning coal is thinner, averaging about 3 feet 2 inches thick. The top coal, usually 6 to 14 inches thick, is bony, and is picked out of the clean coal after shooting. The main bench is from 2 feet 4 inches to 2 feet 10 inches thick. The main bench is separated from a bottom bench, usually from 4 to 6 inches thick, by a shale parting 3 to 10 inches thick. The bottom, which is rolly, is fire clay and soft sandstone; the roof is shale and sandstone.

## Shade Township.

Brookville ("A") Coal. This bed is thick in Shade township, averaging over 4 feet including impurities. The coal is always high in sulphur and ash, and numerous shale and bone partings make mining unprofitable in many localities. The Lower and Upper Kittannings are much better quality and the Brookville will not be mined extensively until they have been exhausted. At the present time the only openings in the Brookville are prospects and small country banks.

Clarion ("A′") Coal. This coal is persistent in Shade township, but rarely attains mineable thickness, usually averaging less than 2 feet thick. In some places the bed is clean, but generally it is split into two or more benches by bone and shale partings ranging from 1 to 6 inches thick.

Lower Kittanning ("B") Coal. This bed is the most important coal mined in Shade township, ranging from 3 to 7½ feet thick. It is never entirely clean, being separated into two or more benches by bone and shale partings. Locally a few inches of coal at

the top is bony. The bench usually mined ranges from 2½ to 5 feet thick. The roof is sandstone and shale; the bottom, shale and fire clay.

In the vicinity of Cairnbrook and Reitz the Lower Kittanning coal ranges from 3 feet 3 inches to 5 feet 10 inches thick. This includes a top bony bench usually present, ranging from 6 to 14 inches thick, which must be picked out of the coal after shooting. The main bench ranges from 2 feet 8 inches to 4 feet thick. It is good coal, but contains numerous thin lenses of pyrite. This bench is the only one mined, and is separated from a lower bench by a shale parting ranging from ½ inch to 12 inches thick. Underneath this parting is a bench of good coal generally about 6 inches thick, but ranging from 2 to 16 inches. Locally a still lower bench of coal about 3 inches thick underlies a shale parting ranging from 2 to 8 inches thick. This bench is never mined.

In the vicinity of Central City, and on the headwaters of Dark Shade Creek the Lower Kittanning varies much in physical character. In the immediate vicinity of Central City the bed is usually about 5 feet thick, including 10 inches of impure top coal that is shipped. Underneath this top coal is 10 inches of bony coal that must be separated by the miners before the coal is loaded. The main bench is usually about 3 feet 4 inches thick, and is of good quality. Beneath the main bench is a 4-inch shale parting and a lower bench of coal about 8 inches thick which is not mined. The roof is black shale; the bottom, fire clay.

East of Cairnbrook along the western slope of Allegheny Mountain, the Lower Kittanning is usually about 4 feet 8 inches thick, including 14 inches of bony coal at the top. Beneath this bony coal is a main bench of good coal usually about 3½ feet thick. This bench contains numerous ¼-inch bone and "sulphur" partings near the bottom. Underneath these partings is a 7-inch bench of good coal. Locally there is an additional bench of coal beneath the latter one, which ranges from 2 to 8 inches thick. This lower bench is not mined. The bottom is fire clay, and the roof, shale.

South of Central City, and east of Buckstown the Lower Kittanning varies greatly in physical character. It ranges from 5 to 9 feet thick, including impurities. Usually 8 inches at the top of the bed is poor grade, bony coal and is not shipped. Beneath this bony coal is 2½ feet of good coal which carries some pyrite. This coal lies on 12 to 16 inches of bony coal which must be separated from it and from an underlying bench of good coal ranging from 2 feet 4 inches to 4 feet thick. This bench is separated from a bottom bench of coal, usually about 8 inches thick, by 12 inches of shale. The bottom is shale and fire clay; the roof, shale and sandstone.

In the vicinity of Kantner, Rowena, and Pokeytown the Lower Kittanning coal ranges from 4 to 8 feet thick, including impurities. The top of the bed varies greatly in physical character. In some places the coal is clean up to the roof; in other places a "draw slate", ranging from a few inches to 5 feet thick, is present.

Locally there is a few inches of bone coal at the top. Beneath the impurities the succession is as follows: Main bench coal, 6 inches to 3 feet 4 inches; shale parting, 4 inches to 4 feet; coal 4 to 18 inches; shale parting 2 to 9 inches; coal, few inches to 2 feet. The bottom is fire clay; the roof, shale and sandstone. In some mine these lower benches are not taken up, and the shale parting below the main bench is used for bottom.

In the vicinity of Hooversville, and along Fallen Timber Run the Lower Kittanning coal averages 4 feet thick, ranging from 3 to 5 feet. A local top bench of coal, ranging from 1 to 6 inches thick, occurs above a shale and bone coal mixture 4 to 12 inches thick. This bone coal mixture is taken down in the headings for height, and falls when the coal is mined out beneath it. A small bench of coal above is lost when mixed with these impurities. Beneath this bone coal mixture is a bench of good coal ranging from 12 to 14 inches thick, and separated from the main bench by a bone parting 1 to 2 inches thick. The main bench of coal is usually between 3 and 4 feet thick, and is clean with the exception of pyrite nodules and "sulphur" streaks. Under the main bench there are locally; a thin shale parting: Coal, 6 inches; shale parting, 12 inches; bottom bench coal, 8 to 12 inches. The bottom is shale and fire clay; the roof, shale and sandstone.

*Upper Kittanning ("C'") Coal.* This bed is second only to the Lower Kittanning in importance, and has an extensive outcrop in Shade township.

In the vicinity of Cairnbrook and Central City, the principal mining centers in the Upper Kittanning, the bed averages about 3½ feet, although locally it is 5 feet thick. The bed is entirely clean, with the exception of bone coal at the top ranging from 6 inches to 2 feet thick. Locally the top bench of coal, ranging from 1 to 8 inches thick, is present above this bony coal. The roof is shale and sandstone; the bottom, fire clay and limestone.

The Upper Kittanning is not being mined on a large commercial scale in Shade township east of Stony Creek. Numerous prospects and small mines indicate that the bed will average about 3½ feet thick in the western part of Shade township. In most places the coal is clean, but locally it is divided into two or more benches by thin bone and shale partings, and may have 2 to 8 inches of bone coal at the top.

*Upper and Lower Freeport ("E") ("D") Coals.* These coals outcrop southeast of Hooversville along Fallen Timber Run, northwest of Buckstown, northeast of Reels Corner, south of Central City, east of Cairnbrook, and north of Hooversville. These beds are not producing coal for commercial shipment at present, the entire output being used locally by farmers. The thickness of these beds averages less than 3 feet, and varies greatly. Impurities are always present.

## Stony Creek Township.

Only that part of Stony Creek township lying north of a line running east and west about a mile south of Boone and Shanksville, is discussed in this bulletin. The coal production in Stony Creek township is very small, because the only railroad is along Stony and Wells creeks on the western border of the township. Commercial mining will be delayed until railroad spurs have been laid into this virgin territory.

Brookville ("A") and Clarion ("A′") Coals. Although these coal beds are very persistent and distinct in this township, very little prospecting and no mining has been attempted, chiefly because the outcrops indicate that both beds are too impure to be mined commercially at the present time, and because a large part of this township has no transportation facilities for commercial shipments. These beds probably average over 3½ feet thick, including impurities. The physical character of these beds varies much locally. The Brookville is probably the thicker, but is extremely impure because of the presence of thick shale and bone partings. These coals may be of value when the beds of better quality have been exhausted.

Lower Kittanning ("B") Coal. This coal outcrops on Allegheny Mountain near the headwaters of Boone Creek and Coal Run, and at numerous localities along Stony Creek and its tributaries. It is not being mined on a commercial scale in this township, principally because other beds are more easily accessible to railroads. Outcrop indications are that it preserves the same physical character as in Shade township. It will probably average about 3½ feet thick, ranging from 3 to 5½ feet, including impurities. The thick bone coal is present at the top, and one or more small benches of coal occur below the main bench. The main bench is a good grade of coal, but rather high in sulphur because of the presence of pyrite.

Upper Kittanning ("C′") Coal. This bed is being mined extensively along the eastern banks of Stony and Wells creeks. It ranges from 2 feet 8 inches to 4 feet 6 inches thick, including impurities. In the vicinity of Coleman, Kimmelton, Lambertsville, and Mostoller the bed is divided into numerous benches by shale partings. The top bench of coal ranges from 5 inches to 2 feet 8 inches thick, and is separated from the bench below by a shale parting ranging from ½ inch to 2 inches thick. The middle bench of coal ranges from 6 inches to 2 feet 8 inches thick. This coal is clean except for streaks and nodules of pyrite. A lower bench, ranging from 6 to 10 inches thick, is sometimes present, but is very dirty and is not mined for shipment. The bottom is fire clay and limestone; the roof, sandstone and shale.

Lower Freeport ("D") Coal. This coal outcrops east of Wells and Stony creeks in a general northeast-southwest line running half a mile west of Shanksville and Boone. The only commercial mines in this bed are in the vicinity of Stoystown, where the bed ranges from 2 to 3½ feet thick, averaging about 3 feet. Locally the bed is divided into two benches by a shale parting ¼ inch thick or less.

The top bench is usually about 18 inches, and the bottom bench from 4 to 10 inches thick. In other localities, where the bed is divided into three benches by shale partings 1 to 2 inches thick, the top bench is usually about 2 feet 1 inch, and the middle and bottom benches are 6 to 10 inches thick. The bottom is limestone and fire clay; the roof, shale and sandstone.

*Upper Freeport ("E") Coal.* This coal outcrops a short distance above the Lower Freeport. It is being mined commercially east of Mostoller, where it averages about 5 feet thick, including impurities. A "draw slate" about 6 inches thick is present at the top. The bed is divided into four benches of coal as follows: Top bench coal 6 inches; bone coal 1 inch; main bench clean coal 2 to 3 feet; shale 1 inch; coal 4 inches; shale 1 inch; coal 10 inches; canneloid coal 12 inches. The bottom is fire clay; the roof, sandstone.

The Upper Freeport coal is mined in several places by farmers for local use. It varies much in thickness and quality, and is never clean. It is doubtful whether this coal will have the great future importance which the Upper and Lower Kittanning undoubtedly will enjoy.

## Somerset Township.

That part of Somerset township lying north of a line running east and west near the County Home, Edgemont, and Indiantown, is discussed in this bulletin.

*Brookville ("A") and Clarion ("A′") Coals.* These beds a not being mined at present on a commercial scale in this township. The Brookville may be of mineable thickness at some localities, but outcrops indicate that it is extremely impure. The coal is high in sulphur and ash because of the presence of many shale and pyrite lenses.

*Lower Kittanning ("B") Coal.* This coal is not being mined commercially in this township, principally because it is deep under cover in practically the entire area. The writer has reason to believe after examination of many drill hole records, that this bed will have future importance when the more easily accessible coals have been exhausted. It ranges from 2½ to 6 feet thick. In some localities it is clean coal; in others it is separated into two or more benches by bone and shale partings 2 to 6 inches thick. The main bench of coal is 2 to 4 feet thick. The bed generally has from 4 to 16 inches of bone coal at the top. The bottom is fire clay and shale; the roof, sandstone and shale.

*Upper Kittanning ("C′") Coal.* This bed averages about 4 feet thick, including impurities. It is mined along the Baltimore and Ohio railroad at Somerset, Listie, and Adams. Elsewhere mining has been delayed because the outcrop is limited to that part of the township lying east of the railroad.

At Somerset the Upper Kittanning averages about 4½ feet thick, including impurities. Two to 4 inches of bony coal forms the top. The main bench ranges from 2 feet 4 inches to 3 feet 8 inches thick. Under it is a fire clay parting from 2 inches to 2 feet thick. The bottom bench of coal, ranging from 8 to 14 inches, is high in ash and sulphur, but is being mined.

In the vicinity of Listie and Geiger the Lower Kittanning averages 4½ feet thick, including impurities. The top bench of coal ranges from 18 inches to 4 feet thick. This bench contains a few thin partings of bone and "sulphur". Below it is a parting ranging from 1 inch to 7 feet thick, which varies much in physical character. In some localities it is soft shale mixed with coal, the bottom being hard shale; in other localities, where the parting is thickest, it is composed of shaly sandstone. The bench of coal lying beneath this parting ranges from 18 inches to 3 feet thick, and is locally dirty and not mined. Then follows 2 to 8 inches of shale, 2 to 5 inches of coal, 2 to 6 inches of shale, and 3 inches of coal.

In the vicinity of Adams and Friedens the Upper Kittanning ranges from 2½ to 4½ feet thick. The top bench, ranging from 18 inches to 3 feet, is good clean coal, and is separated from a bottom bench by a shale parting 1 to 3 inches thick. The bottom bench is usually about 6 inches thick, and too high in sulphur to be mined commercially. The roof is sandstone; the bottom, limestone.

Lower Freeport ("D") Coal. This bed outcrops east of Somerset on the Bedford pike, and along Wells Creek in the vicinity of Listie, Wells Creek, and Friedens. It has been mined for several years in the vicinity of Friedens, and is highly prized as a smithing coal. It has also been mined at a great number of places for local use where the thickness ranges from 2 feet 6 inches to 4 feet 2 inches. The bed usually occurs as a single bench of clean coal.

In the vicinity of Listie and Adams the bed averages 3½ feet of clean coal. It has a single persistent 1/16 inch parting near the middle. The roof is shale; the bottom, fire clay.

In the vicinity of Friedens the bed is a single bench averaging 2 feet 9 inches thick. The roof is gray shale; the bottom, hard fire clay.

Upper Freeport ("E") Coal. This bed is the most extensivel mined coal in the township, probably because it is the most easily accessible. It ranges from 2 feet 8 inches to 3 feet 10 inches thick, averaging 3 feet 6 inches. It is always separated into two or more benches by shale partings which vary much in thickness at different localities.

In the vicinity of Somerset the bed is generally 3 feet 5 inches thick, including impurities. A bone coal, usually about 6 inches thick, is present at the top of the bed. The divisions below the bone coal are as follows: Main bench of clean coal, 2 to 3 feet thick; shale parting ½ to 2 inches; coal 3 to 6 inches; shale partin 1 inch; bony coal 2 inches.

Along the Baltimore and Ohio railroad between Somerset and Geiger the Upper Freeport coal averages 3 feet thick, including impurities. The bed contains 1 or 2 inches of bony coal at the top; a main bench underneath 2 feet 7 inches thick; parting 1 inch; coal 2½ inches; shale parting 1 inch; dirty coal 1½ inches.

Between Geiger and Friedens, particularly in the vicinity of Listie, the coal averages 3½ feet thick. The bed usually has 4 to 6 inches of bony coal at the top. The main bench is usually 2 feet 8 inches thick, and is separated from a middle bench 4 inches thick, by a shale parting 1 inch to 1½ inches thick. The middle bench is separated from an impure bottom bench usually about 4 inches thick, by a shale parting ranging from ½ inch to 1 inch thick. The bottom is fire clay; the roof, shale.

## Jefferson Township.

Jefferson township lies on the eastern slope of Laurel Hill, and on the western flank of the Johnstown anticline. The coals are rising rapidly northwest, and the Allegheny formation outcrops just west of Bakersville. East of Bakersville the Allegheny formation, which contains valuable coal beds, is under cover. Prospecting and developing in Jefferson township have been delayed because transportation facilities are inadequate.

The writer made a reconnaissance in this township in the summer of 1921, and found that the only production is from country banks west of Laurel Hill Creek. The area in which the steeply dipping coal beds outcrop is a belt generally less than 1 mile wide. No attempt was made at definite correlation, but at least three mineable coal beds were noticed. Drill hole records and surface observations indicate that the Lower Kittanning, Upper Kittanning, and the Lower and Upper Freeport coals are of mineable thickness at a few localities. These coals vary much in physical character, bein locally entirely clean. They are generally divided into two or more benches by shale partings varying much in thickness. The writer believes that this township will produce much commercial coal after the exhaustion of coal beds having access to better transportation facilities.

## Lincoln Township.

This township lies in the western part of the district, and on the eastern slope of Laurel Hill and in the Johnstown basin. The principal outcropping rocks in the township are in the Conemaugh. This is not an important coal-bearing formation at present. The Allegheny formation, containing the valuable coal beds, outcrops on Quemahoning Creek in the vicinity of Sipesville and along Laurel Hill. Development of these coals has been delayed because of this fact.

*Brookville ("A") and Clarion ("A′") Coals.* These coals outcrop only on the western slope of Laurel Hill, and far distant from any railroad. They vary much in physical and chemical character but are of mineable thickness and quality at many localities. Drill hole records indicate that the Brookville especially will be of some future importance.

*Lower Kittanning ("B") Coal.* This bed is not being mined at present on a commercial scale in this township, because its outcrop is limited to a small area and transportation facilities are bad. The Lower Kittanning will probably average $3\frac{1}{2}$ feet thick in this township, and will be mineable at most every locality. The writer believes that it will not show the good quality and thickness which it has east of Stony Creek.

*Upper Kittanning ("C′") Coal.* This bed is mined by slope near the northern line of Lincoln township west of Acosta, where it averages 3 feet 8 inches thick. Drill hole records in the Johnstown and Somerset basins, and outcrops along Laurel Hill indicate that this thickness is very persistent throughout the entire township. The bed is never entirely clean, being separated into two or three benches by black shale partings varying much in thickness.

Where mined north of Sipesville and west of Acosta the bed occurs in three benches, as follows: Coal 16 to 24 inches; shale $\frac{1}{4}$ to 3 inches; middle bench 18 to 32 inches; shale 1 to 6 inches; bottom bench 4 to 12 inches. This bottom bench contains many thin shale partings and "sulphur" streaks, and is not mined for shipment. The bottom is shale and limestone; the top, shale and sandstone.

*Lower Freeport ("D") Coal.* This bed is persistent in Lincoln township, but appears to be subject to great irregularity in thickness. Drill hole records indicate that it is of mineable thickness in some localities where it occurs in a single bench, ranging from 18 inches to 3 feet 2 inches thick. It outcrops on the eastern slope of Laurel Hill and ranges from 6 inches to 4 feet 3 inches thick.

*Upper Freeport ("E") Coal.* The greatest production in this township comes from this bed. It is mined extensively by drift in the vicinity of Sipesville and Acosta. It averages about 3 feet 8 inches thick in the township, ranging from 3 to 5 feet. The bed is separated into three benches by shale partings. Drill hole records and outcrops at points where it is not being mined at present indicate that the coal is very regular in thickness and is of mineable quality practically everywhere.

In the northern part of this township, where the bed is now being mined extensively, it is usually divided into three benches. The section from the top down is: Bony coal 4 to 10 inches; top bench coal 22 to 38 inches; shale parting $\frac{1}{2}$ to 2 inches; middle bench 4 to 8 inches; shale parting $\frac{1}{2}$ to 3 inches; bottom bench 4 to 10 inches. The bottom bench is usually clean, but locally contains numerous small "knife blades" of bone and pyrite. The bottom is fire clay; the roof, sandstone.

## Quemahoning Township.

The principal outcropping rocks in this township are of Conemaugh age. The Conemaugh formation contains no coals which are of merchantable thickness and quality at the present time. The Allegheny formation, containing the principal commercial coals in this township, outcrops along Stony Creek, Wells Creek, Quemahoning Creek, Twomile Run, and Higgins Run.

**Brookville ("A") Coal.** This coal is thick in this township, but extremely impure. It averages about 4 feet thick, ranging from 3 to 7 feet. It is high in ash and sulphur everywhere because of the presence of numerous shale and bone partings and pyrite nodules. These partings range up to 2 feet thick, dividing the bed into two main benches. These are subdivided into smaller benches by thin partings. This coal is of mineable thickness and quality at a few localities on Quemahoning and Stony creeks, but it will not be able to compete on the market with the Kittanning and Freeport groups of coals unless washing devices and picking tables are installed.

**Clarion ("A'") Coal.** This bed is persistent in Quemahoning township, but is rarely mineable. It averages 2 feet thick, and is locally split into two or more benches by bone and shale partings ranging from 1 to 8 inches thick. The coal is high in sulphur.

**Lower Kittanning ("B") Coal.** This bed is mined by drift at several localities on Stony and Wells creeks, where it ranges from 3 to 5 feet thick, including impurities.

In the vicinity of Coleman, Kimmelton, Mostoller, and Stoystown the entire bed averages 14 feet and has the following section:

| | |
|---|---|
| Shale, black | |
| COAL, (containing thin bone partings) - - | 10" |
| Fire clay, soft - - - - - - - - - - - - - - - | 1' 3" |
| COAL, (containing thin bone partings) - - | 2' 0" |
| Sandstone, soft - - - - - - - - - - | 5' 0" to 7' 6" |
| COAL, soft (contains sulphur streaks) - - | 2' 8" |
| Shale, hard - - - - - - - - - - - - - | 0' 1" to 0' 8" |
| COAL, good - - - - - - - - - - - - - | 1' 4" to 1' 8" |
| Fire Clay, hard | |

Opposite Rowena and Hooversville the Lower Kittanning averages 3 feet 4 inches thick, ranging from 3 to 4 feet. The bed contains an average of 7 inches of bony coal at the top which must be separated from the coal after shooting. The main bench of coal is usually about 2 feet thick, and contains numerous thin partings of "sulphur". A 20-inch shale parting is underlain by a lower bench of coal 2 to 10 inches thick. The bottom is fire clay; the roof, shale and hard sandstone.

North of Hooversville, and in the vicinity of Blough and Landstreet, the coal averages 3 feet 3 inches thick, ranging from 3 feet to 4 feet 2 inches. The bony coal is present only locally at the top of the bed, and the main bench below it averages 3 feet thick. The coal in this bench is very free from sulphur, but contains a small number of thin bone streaks. Under this main bench is 3 inches of bony coal that is picked when mined. This bony coal is separated from a lower bench of coal 1 to 8 inches thick which is only locally present, by a shale parting ranging from 2 to 10 inches thick. The bottom is shale and fire clay; the roof, shale.

Upper Kittanning ("C′") Coal. This bed is the most important producer in this township. It is being mined on Stony and Quemahoning creeks and their tributaries. It ranges from 2½ to 4½ feet thick, averaging about 3½ feet. It is a coal of excellent quality, and is highly valued for steam, domestic, and railroad fuel.

In the southeastern part of Quemahoning township in the vicinity of Stoystown and Mostoller, the Upper Kittanning coal averages 3½ feet thick, and is divided into two benches by a 2 to 3 inch shale parting. The top bench is usually about 3 feet thick, and is overlain by "draw slate" 1 to 3 inches thick. The bottom bench ranges from 3 to 8 inches thick, and is usually good clean coal. It is locally underlain by a bench of bony coal averaging about 4 inches thick. The bottom is fire clay; the roof, sandstone.

In the northern part of Quemahoning township the Upper Kittanning coal ranges from 2 feet 8 inches to 4 feet thick, averaging 3 feet 5 inches thick. The coal generally occurs in one bench and contains numerous streaks of "sulphur." Locally the bed is divided into two benches by a ¼ to 4 inch shale parting.

In the southwestern part of Quemahoning township in the vicinity of Ralphton, the Upper Kittanning averages 3 feet 8 inches thick, ranging from 3 feet 2 inches to 4 feet thick. The bed is separated into two benches by a ¼ to 1 inch shale parting. The top bench is usually about 4 inches thick, and the bottom bench 3 feet 3 inches. The roof is shale and sandstone; the bottom, shale and fire clay.

In the western part of the township on Twomile and Higgins runs, the coal averages 3 feet thick, including a 3-inch bony bench at the top. The main bench of clean coal ranges from 2 feet 7 inches to 3 feet 6 inches thick. The roof is shale and sandstone; the bottom, shale and limestone.

Lower Freeport ("D") Coal. This bed appears to be irregular in thickness in this township, and is not being mined commercially at the present time. It ranges from 6 inches to 3½ feet thick, averaging approximately 2 feet. It is usually a clean coal, but is locally separated into two or more benches by partings of shale and bone.

Upper Freeport ("E") Coal. This coal is mined commercially on the Boswell Branch of the Baltimore and Ohio railroad in the western part of the township. It averages 3 feet 4 inches thick, and is extremely impure in some localities. The main bench ranges from 2½ to 3 feet thick, and is overlain by a bony bench 3 to 8 inches thick. It is separated from a bottom bench 3 inches thick of variable quality, by a 1 to 2 inch shale parting. This bench is separated from a lower bench of dirty coal, by a shale parting 1 inch thick.

On Stony Creek the Upper Freeport varies much in physical character, but is of mineable thickness at most localities. It is always divided into two or more benches by shale and bone partings, the main bench ranging from 2 to 3½ feet thick. From 2 to 8 inches of bony coal is always present at the top of the bed. The roof is sandstone and shale; the bottom, fire clay and shale.

## Jenner Township.

All of the coal produced in this township comes from beds in the Allegheny formation which outcrops on Twomile and Roaring runs, Beaverdam and Quemahoning creeks, and on the eastern slope of Laurel Hill. The thin coal beds of the Conemaugh formation outcrop in the Johnstown basin west of Boswell. The Monongahela formation, containing the Pittsburgh coal, outcrops in a few hilltops in the Johnstown basin north and south of Roaring Run and in the vicinity of Glessner. This formation has been entirely eroded with the exception of the Pittsburgh coal, and a few feet of the formation above it. The Pittsburgh coal is mined only for domestic use and is now practically exhausted.

Brookville ("A") Coal. This bed is not being mined for commercial coal at present. It has been prospected for farm use at several localities, but its quality and thickness are so variable that it will only be of value in the future when the Kittanning and Freeport groups of coals have been exhausted. The Brookville ranges from 2 to 8 feet thick, including impurities. It is always divided into two or more benches by shale partings ranging from a few inches to 3 feet thick. The coal contains much pyrite.

Clarion ("A′") Coal. This bed has been recognized at only a few localities in the township, and its commercial value is doubtful because it varies so much in thickness. The coal is also extremely high in sulphur and ash.

Lower Kittanning ("B") Coal. This coal is being mined commercially on the Boswell Branch of the Baltimore and Ohio railroad in the vicinity of Randolph, Boswell, and Critchfield. It averages about 3 feet thick, ranging from 2 feet 6 inches to 3 feet 10 inches thick. It is separated into two or more benches by bone and shale partings.

In the eastern part of Jenner township and on the Boswell anticline, the Lower Kittanning coal averages 3 feet thick. In the

vicinity of Randolph it averages 3 feet 2 inches thick, including 6 inches of bony coal at the top.

At Acosta, Jenners, and Boswell the coal averages about 3 feet thick, and is divided into two or more benches by shale or bone partings. The main bench ranges from 2 to 3 feet thick. Above this main bench is a thin bench ranging from 6 to 8 inches, which is usually clean coal but locally bony. It is separated from the main bench by a shale and bone parting ½ inch to 6 inches thick. The main bench is underlain by 4 to 6 inches of bone coal and a local bottom bench of coal from 1 to 5 inches thick. The bottom is sandstone and fire clay; the roof, sandstone and shale.

The Lower Kittanning crops out on the eastern slope of Laurel Hill near the headwaters of Beaverdam and Roaring runs. It is not being worked in this locality at present, but outcrops indicate that it is of commercial value in some places, ranging from 2 to 4 feet thick. It is separated into two or more benches by bone and shale partings ranging from 1 to 5 inches thick.

Upper Kittanning ("C′") Coal. This bed is one of the most important producers in this township, and numerous large commercial mines are working this coal. The bed averages 4 feet thick, and ranges from 3 to 5½ feet thick. It outcrops on Quemahoning Creek and Twomile Run and their tributaries, and on the flanks of the Boswell anticline.

In the vicinity of Acosta the Upper Kittanning averages 3 feet 10 inches thick. It is divided into two benches by a shale binder 1 to 2 inches thick. The top bench ranges from 16 to 22 inches thick, and the bottom bench is usually 2 feet 3 inches thick. The bed is overlain by black shale 3 feet thick. Locally a thin bench of coal is present underneath the lower bench and separated from it by 4 inches of shale. In some mines the coal is divided into three benches by ¼ inch partings and has about 6 inches of bone coal at the top. The top bench of coal is usually about 6 inches thick, the middle bench 2 inches, and the bottom bench ranges from 2 feet 6 inches to 3 feet thick. In the vicinity of Critchfield and Ralphton the bed averages 3 feet 8 inches thick, not including 4 inches of bony coal at the top. The main bench is separated from this bony coal by a 4-inch shale parting. The main bench ranges from 2 feet 4 inches to 3 feet 8 inches thick. The bottom is shale and limestone; the roof, shale and sandstone.

On the Western Maryland railroad west of Coal Junction the entire bed averages 5 feet 4 inches thick and displays the following section: Shale, black; COAL 4"; COAL, bony 3"; COAL, dirty 6"; shale 7"; COAL, clean 12"; shale and coal 3"; COAL, clean 1'10" to 2'4"; shale 2"; COAL, bony 4"; fire clay and bone coal.

The Upper Kittanning varies much in physical character in the vicinity of Jenners, where it averages 4 feet 3 inches thick. The entire bed is often 6 to 8 feet thick. In some mines the coal occurs in a single bench, with 4 inches of bone coal on top and 5 inches of

shaly coal on the bottom. The clean coal averages about 4 feet thick. In other mines the bed is divided into four benches by partings and binders. The usual condition of the bed is: "Draw slate" 4 inches, top bench coal 9 inches, shale parting ¼ to 6 inches, main bench coal 4 feet, shale 2 inches, lower bench dirty coal, not mined, 4 to 6 inches. Below this is a ½-inch shale parting and a bottom bench which also is dirty and not mined.

In the vicinity of Boswell the Upper Kittanning coal averages over 6 feet thick but carries many impurities. The top bench or "roof coal", 9 inches thick, is impure and not mined. Under this follow in order: Shale, 2 inches; coal, high in sulphur, 12 inches; shale, 2 to 4 inches; clean coal, 2 feet 4 inches; shale, 2 inches; clean coal, 2 feet 8 inches. The bottom is shale and limestone; the top is sandstone and shale.

Lower Freeport ("D") Coal. This coal is not being mined in this township because its thickness and quality do not compare favorably with adjoining beds. This bed is subject to great irregularity in thickness and quality, ranging from a few inches to 4 feet thick, and from a high ash and sulphur coal to a coal having an excellent reputation in adjoining township as a smithing coal. It has been prospected at a great many places in the township, and is practically everywhere separated into two or more benches by shale and bone partings. Bony coal 2 to 8 inches thick is present at the top of the bed.

Upper Freeport ("E") Coal. This coal is very important in this township, where it is mined by drift, shaft, and slope along the Baltimore and Ohio and Western Maryland railroads. The coal outcrops along Quemahoning Creek and its tributaries, on the east and west slopes of the Boswell anticline, and along the eastern slope of Laurel Hill on the headwaters of Beaverdam Run and North Branch of Quemahoning Creek. It averages 4 feet thick throughout the township, ranging from 3 to 5 feet. This coal enjoys an excellent reputation as a steam, domestic, and railroad fuel.

In the vicinity of Acosta the bed averages 3 feet 10 inches thick. It includes a bony coal at the top, a main bench of coal 2 feet 6 inches to 3 feet 10 inches thick, shale parting 1 to 2 inches, middle bench 4 to 6 inches, shale parting ¼ to 1 inch, lower bench 7 to 8 inches. The bottom is fire clay; the roof, shale.

In the vicinity of Critchfield and Ralphton the coal averages 3 feet 11 inches thick, but is not being mined extensively at present. A bony coal bench 6 inches thick is present at the top of the bed. Shale partings ½ to 2 inches thick separate the bed into a main bench of clean coal 2 feet 8 inches to 3 feet 4 inches thick, middle bench 4½ inches thick, and a bottom bench, present locally, 2 to 4 inches thick. The bottom is fire clay; the roof, shale.

In the vicinity of Coal Junction and on the Western Maryland railroad the Upper Freeport averages 4 feet thick. The characteristic 8-inch bony coal overlies the following section: main bench clean coal

3 feet; shale, ½ to 1½ inches; middle bench 4½ inches; shale, 1 to 3 inches; lower bench, dirty, and sulphurous, 7 inches. The bottom is fire clay; the roof, sandstone.

The bed along the Western Maryland railroad varies much in physical character, often being separated into several benches by 1- to 4-inch shale partings. A main bench of clean coal ranging from 2 feet 8 inches to 3 feet 10 inches thick is always present.

In the northern part of the township, in the vicinity of Boswell, the Upper Freeport coal averages 3 feet 8 inches thick. Six inches at the top is bony. The bed is divided by 1-inch shale partings into a main bench of clean coal 3 feet thick, a middle bench 3 inches thick, and a lower bench 4 inches thick. The bottom is shale and fire clay; the roof, sandstone.

## Conemaugh Township.

Brookville ("A") Coal. This coal outcrops on Shade Creek as far south as Foustwell. It has not been mined commercially, but where prospected it averages about 4 feet thick, including numerous partings of bone and shale. Two benches, each ranging from 15 inches to 2 feet thick, occur locally and may have future commercial value. The coal is high in ash and sulphur.

Clarion ("A′") Coal. This bed has not been mined or prospected in this township. It ranges from 1 to 5 feet thick and is nowhere entirely clean, being separated into numerous benches by shale partings. The coal is extremely high in ash.

Lower Kittanning ("B") Coal. This bed is one of the most important producers in this township. It averages about 4 feet thick, including a shale and bone parting ranging from 1 to 6 inches thick, from 3 to 12 inches above the bottom. The lower bench is not worked. The top bench, containing the commercial coal, averages 3 feet thick and is clean with the exception of lenses of pyrite and bone. Locally one or more thin bone or shale partings are present in the top bench.

In the vicinity of Holsopple and Foustwell the bed averages about 4 feet thick, ranging from 2 feet 6 inches to 5 feet 7 inches. The section of the bed is as follows: Top, bony coal, 2 inches; coal, clean, 18 to 24 inches; bone coal parting, 8 to 14 inches; shale, 12 to 16 inches; coal, 8 inches; bottom, shale and fire clay.

In the northeast part of the township the Lower Kittanning coal is very regular in physical character, usually being divided into two or more benches by thick shale partings. The top and main bench ranges from 2 to 4 feet thick. The two lower benches usually are very dirty and are not mined. They are separated from the main bench by a "blackjack" parting ranging from 3 inches to a foot or more thick.

The Lower Kittanning coal is under thick cover west of Stony Creek and is not being mined because other coals are more easily accessible along the creek and close to the railroad. Diamond drill holes indicate that the Lower Kittanning will average between 2½ and 3½ feet thick in areas where it is not being mined at present.

Middle Kittanning ("C") Coal. This bed has not been mined in this township because of its extreme irregularity in thickness and the limited area of its outcrop. The bed ranges from a few inches to 3 feet thick and usually is bony.

Upper Kittanning ("C′") Coal. This bed is very important in Conemaugh township. Most of the commercial mines are located along its outcrop west of Stony Creek. It is also mined by slope and shaft at Jerome. The coal increases in thickness south from Johnstown and averages about 4 feet thick, ranging from 3 feet to 5 feet 2 inches. In some localities the bed is clean, but usually it carries a thin bony streak at the top and a few inches of bony coal at the bottom. The roof is shale and sandstone; the bottom, shale and limestone. The coal is remarkably uniform and "rolls" are seldom encountered.

In the vicinity of Holsopple and Foustwell the Upper Kittanning is locally 4 feet thick, averaging approximately 3 feet 6 inches. Locally it is very clean, but usually it is divided into two benches by a ¼-to 1-inch bone parting from 3 to 6 inches below the top. The top bench is usually clean, but in some places is bony and must be separated before the coal is shipped. The main bench ranges from 2 feet 4 inches to 3 feet 8 inches thick, and is clean coal. A local bottom bench, ranging from 4 to 12 inches thick, is present below the main bench but is not mined.

The Upper Kittanning is mined extensively in the vicinity of Jerome where it ranges from 4 to 5 feet thick. The average section is as follows: Shale roof; coal, bony, 10 inches; coal, clean, 2 feet 6 inches; sulphur and bone, 2 to 12 inches; coal, clean, 1 foot 6 inches to 4 feet; shale, 1 to 3 inches; coal, dirty (not mined), 6 to 10 inches; shale and limestone.

The Upper Kittanning coal has a columnar structure, is of medium hardness and stands shipment well. Locally it is rather high in sulphur and ash, but in general it is a good low-volatile coal.

Lower Freeport ("D") Coal. This coal outcrops along Stony Creek, but is not being mined at present because of the proximity of the thicker beds. It ranges from a few inches to 4 feet thick, averaging less than 2½ feet. It is usually clean, but locally is split into two or more benches by bone and pyrite partings ranging from 2 to 10 inches thick.

Upper Freeport ("E") Coal. This bed, outcropping on Stony Creek and on the South Fork of Bens Creek near Thomas Mills, is not an important producer at present. It is being mined at one locality on Stony Creek where it averages 2 feet thick. It is inclined to be "faulty" and "rolly," and usually carries large amounts of bone and pyrite. Drill hole records west of Stony Creek indicate that it is of mineable thickness in many localities, ranging from 2 to 4½ feet thick

## TABLE OF ANALYSES.

| No. | Bed | $H_2O$ | V.M. | F. C. | Ash | S. | B.t.u. |
|---|---|---|---|---|---|---|---|
| 1. | Pittsburgh | 3.6 | 20.4 | 67.9 | 8.2 | .8 | 13700 |
| 2. | Pittsburgh | 11.5 | 20.1 | 55.2 | 13.2 | .8 | 10228 |
| 3. | U. Freeport | 3.1 | 19.0 | 67.1 | 10.9 | 1.5 | 13415 |
| 4. | U. Freeport | 2.1 | 21.1 | 65.0 | 11.8 | 2.4 | 13433 |
| 5. | U. Freeport | 3.2 | 17.1 | 64.6 | 15.1 | 1.5 | 12893 |
| 6. | L. Freeport | .9 | 17.2 | 73.8 | 8.0 | .7 | 14158 |
| 7. | L. Freeport | 2.9 | 18.7 | 73.2 | 5.2 | .6 | 14353 |
| 8. | U. Kittanning | 1.2 | 15.7 | 74.2 | 9.0 | 1.4 | 14096 |
| 9. | " " | 3.0 | 12.0 | 77.4 | 7.6 | 1.5 | 14070 |
| 10. | " " | 3.3 | 13.0 | 75.4 | 8.3 | 1.5 | 13930 |
| 11. | " " | 3.1 | 15.9 | 73.4 | 7.5 | .7 | 14047 |
| 12. | " " | 4.0 | 15.7 | 74.1 | 6.3 | .7 | 14134 |
| 13. | " " | 2.8 | 16.1 | 73.6 | 7.5 | .8 | 14011 |
| 14. | " " | 1.4 | 15.2 | 73.4 | 10.0 | .9 | 13799 |
| 15. | " " | 2.0 | 17.3 | 69.3 | 11.4 | 3.0 | 13468 |
| 16. | " " | 3.8 | 16.3 | 71.1 | 8.9 | .8 | 13540 |
| 17. | " " | 3.1 | 15.6 | 74.6 | 6.8 | .5 | 14179 |
| 18. | " " | 1.2 | 15.5 | 74.8 | 8.5 | .7 | 14170 |
| 19. | " " | 1.3 | 15.0 | 75.8 | 8.0 | .7 | 14206 |
| 20. | L. Kittanning | 2.1 | 17.5 | 73.3 | 7.1 | 1.8 | 14290 |
| 21. | " " | 2.4 | 13.5 | 77.8 | 6.3 | 1.3 | 14370 |
| 22. | " " | 3.3 | 13.0 | 79.0 | 4.7 | .8 | 14553 |
| 23. | " " | 5.0 | 13.5 | 76.7 | 5.2 | .8 | 14360 |
| 24. | " " | 3.2 | 14.0 | 75.9 | 6.9 | 1.3 | 14140 |
| 25. | " " | 3.5 | 12.4 | 77.6 | 6.4 | 1.3 | 14130 |
| 26. | " " | 4.3 | 12.0 | 78.1 | 5.6 | 1.4 | 14300 |
| 27. | " " | 2.5 | 16.6 | 73.2 | 7.7 | 2.4 | 14114 |
| 28. | " " | 3.1 | 17.3 | 68.3 | 11.3 | 2.0 | 13424 |
| 29. | " " | 2.0 | 16.6 | 73.3 | 8.2 | 2.5 | 14110 |
| 30. | " " | 3.4 | 18.1 | 71.8 | 6.8 | 1.4 | 14114 |
| 31. | " " | 3.4 | 17.2 | 73.0 | 6.5 | .8 | 14103 |
| 32. | " " | 1.8 | 15.2 | 73.3 | 9.8 | 4.5 | 13702 |
| 33. | Brookville | 2.9 | 20.9 | 65.9 | 10.3 | 1.4 | 13329 |
| 34. | Not Correlated | 2.9 | 21.7 | 64.5 | 10.9 | 1.2 | 13459 |
| 35. | Not Correlated | 3.6 | 17.6 | 69.6 | 9.3 | 1.6 | 13529 |
| 36. | Not Correlated | 4.2 | 19.8 | 63.9 | 12.1 | .7 | 12915 |

Locations from which samples were obtained are shown by corresponding numbers on following page.

## Mines and Sample Locations.

| No. | Company | Mine | Location |
|---|---|---|---|
| 1. | Berkey, J. G. | Berkey | Boswell, 2 mi. NW of |
| 2. | Horner, Reuben | Horner | Boswell, 2 mi. NW of |
| 3. | Berkey, Levi | Berkey | Edie, 1 3/4 mi. NW of |
| 4. | -------------- | Neva | Somerset, 3/4 mi. NE of |
| 5. | Quemahoning Coal | Ralphton No. 6 | Zimmerman |
| 6. | Barnes Quemahoning | Stauffer No. 1 | Listie, ¼ mi. N. of |
| 7. | Barnes Quemahoning | Stauffer No. 3 | Somerset, 4½ mi. SE of |
| 8. | Hillworth Coal | Belmont No. 1 | Acosta, ¼ mi. N. of |
| 9. | Berwind-White | Eureka No. 35-C | Windber |
| 10. | Berwind-White | Eureka No. 39 | Windber, 3½ mi. SW of |
| 11. | -------------- | Jenner No. 1 | Stoughton |
| 12. | -------------- | Jenner No. 2 | Jenner |
| 13. | Hillman Coal & Coke | Jerome No. 1 | Jerome |
| 14. | Hillman Coal & Coke | Jerome No. 2 | Jerome, near |
| 15. | -------------- | Oneida | Holsopple, 1/8 mi. N. of |
| 16. | Davis Coal & Coke | Orenda | Boswell |
| 17. | Quemahoning Coal | Ralphton No. 1 | Ralphton |
| 18. | Quemahoning Coal | Ralphton No. 3 | Ralphton |
| 19. | Quemahoning Coal | Ralphton No. 4 | Ralphton |
| 20. | Berwind-White | Eureka No. 30 | Windber, 1½ mi. W. of |
| 21. | Berwind-White | Eureka No. 31 | Windber |
| 22. | Berwind-White | Eureka No. 32 | Windber |
| 23. | Berwind-White | Eureka No. 33 | Windber |
| 24. | Berwind-White | Eureka No. 34 | Windber, 1½ mi. S. of |
| 25. | Berwind-White | Eureka No. 35 | Windber |
| 26. | Berwind-White | Eureka No. 36 | Windber, 1½ mi. NE of |
| 27. | Victor Coal Mining | Haws No. 3 | Holsopple, ¼ mi. NE of |
| 28. | -------------- | Kimmelton | Kimmelton |
| 29. | -------------- | Lenore | Holsopple, 1/8 mi. N. of |
| 30. | -------------- | Lochrie Arrow | Windber, 9 mi. S. of |
| 31. | Loyal Hanna C. & C. | Loyal Hanna No. 6 | Cairnbrook |
| 32. | -------------- | Somerset & Cambria | Border Station |
| 33. | -------------- | Hitechew or Fleegle | Cairnbrook, 2½ mi. SE of |
| 34. | Miller, Jake | Miller | Gillette, 1 3/4 mi. SW of |
| 35. | Sanner and Shaffer | Sanner & Shaffer | Somerset, ½ mi. SE of |
| 36. | -------------- | Wyand | Bakersville, ½ mi. S. of |

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